May 1976

Foreign Markets for U.S. Laboratory Instruments

The executive summary of the
Global Market Survey—Laboratory Instruments

Prepared by:
Office of International Marketing
Bureau of International Commerce
Domestic & International Business Administration
U.S. DEPARTMENT OF COMMERCE

This executive summary from Commerce's *Global Market Survey—Laboratory Instruments* presents highlights of the sales potential for U.S. laboratory instruments in foreign markets. Scheduled for release in June 1976, the Survey is a compendium of market research reports prepared by the Office of International Marketing. The market research was conducted under the supervision of the U.S. Foreign Service-Department of State in 16 countries.

Copies of the *Global Market Survey—Laboratory Instruments* may be obtained from any Commerce district office. The original market research reports, varying in length from 100 to 200 pages, are available at a cost of $10.00 each from:

National Technical Information Service
U.S. Department of Commerce
P.O. Box 1553
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Telephone: (703) 321-8543

The reports should be required by title and number as follows:

"The Market for Laboratory Instruments—(country, number)"

Country	*Number*
Australia	DIB75-05-512
Brazil	DIB75-10-500
Czechoslovakia	DIB75-07-511
Germany	DIB75-08-503
Hong Kong	DIB76-10-505
Iran	DIB76-02-500
Israel	DIB75-02-501
Italy	DIB75-05-513
Japan	DIB75-09-502
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Major Foreign Markets for Laboratory Instruments—An Executive Summary

Laboratory instrument sales in 16 leading countries should exceed $1.8 billion in 1979 (see figure 1) reflecting annual growth of 12% during the remainder of the 1970s. The predicted increases will follow on the heels of already vigorous growth experienced in recent years. These markets soared from over $650 million in 1972 to $1 billion in 1974.

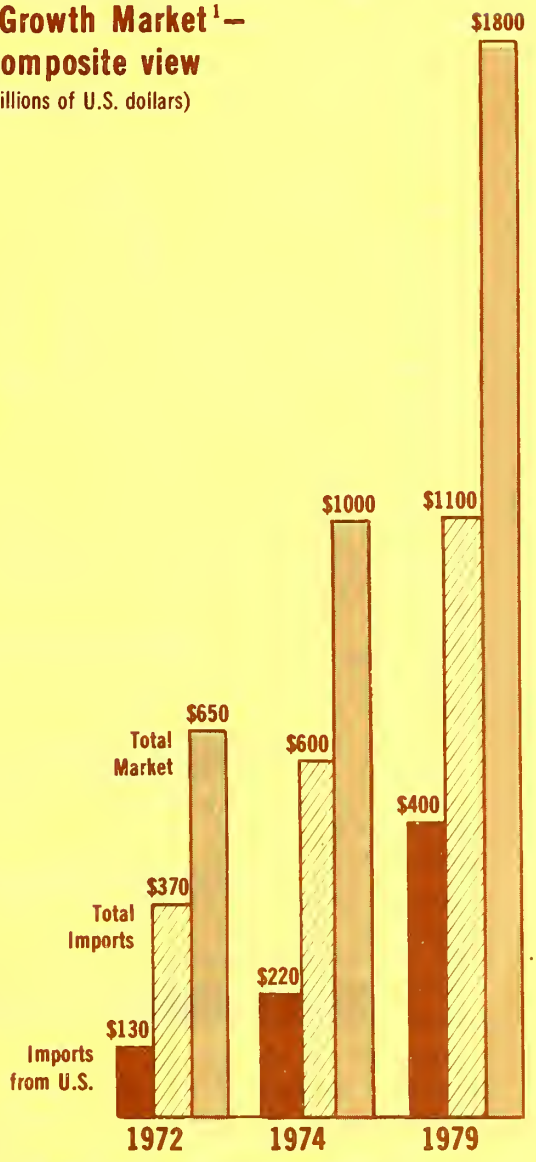
Foreign demand for laboratory testing equipment has increased substantially in recent years and this trend is expected to continue throughout the 1970s. Public concern for establishing higher standards in food, drugs, and consumer product safety has resulted in increased expenditures by governments and industries for expansion of test and evaluation laboratories. Government commitments to resolve energy and environmental problems also has resulted in increased allocations for related research and development. National health programs and greater emphasis on preventive medicine is also forcing accelerated spending on laboratory equipment. So too, is the demand increasing within traditional user industries including manufacturer of chemicals and pharmaceuticals, semiconductors, basic metals, and machinery as well as in government and independent materials testing laboratories.

The findings presented herein are the result of on-site research conducted for the U.S. Department of Commerce. The survey reveals that laboratories are under pressure to produce increasing numbers of analyses with greater efficiency and better accuracy. Scientists are looking toward more advanced instrumentation to accomplish some of these goals.

Although domestic manufacturers in certain foreign countries supply much of the local demand for laboratory instruments, the dependency upon imports has been steadily increasing to meet the more sophisticated needs. In 1974 total imports, in the countries surveyed were valued at $600 million. They are predicted to exceed $1 billion in 1979, a 66% increase.

U.S. manufacturers have been particularly successful in penetrating the market. Over the period 1972-74 imports from the United States increased from 19% of total sales, or $130 million, to 22%, or $220 million. U.S. sales of nearly $400 million are projected for 1979 but could be significantly higher with increased marketing efforts by U.S. firms.

16 Growth Market[1]— A composite view
(in millions of U.S. dollars)



[1] Australia, Brazil, Czechoslovakia, Germany, Hong Kong, Iran, Israel, Italy, Japan, Mexico, Netherlands, Republic of China (Taiwan), Spain, Sweden, United Kingdom, Venezuela.

Source: Bureau of International Commerce, Office of International Marketing research reports

Sales of Selected Instruments

The U.S. Department of Commerce recently surveyed the market for 15 instrument types in each of 16 countries. Seven typical instrument types were selected for quantification of sales in 1974 and 1979 in the Commerce Survey. Figures 2 and 3 display the dramatic growth anticipated in the combined total market and in U.S. sales to 15 countries for these typical instrument types. Table 2 shows the 1979 forecasts of the total market size of these seven types for each country. Table 3 shows 1979 projections of imports from the United States for the same instruments and countries. Some of the highlights revealed in this analysis are as follows:

—Sales of gas chromatographs in the *Republic of China (Taiwan)* are expected to exceed $1 million in 1979 with U.S. manufacturers maintaining their 65% share of the market. Major purchases are planned by laboratories in the petroleum and synthetic fibers industry.

—The market for liquid chromatographs, particularly HPLCs, in *Czechoslovakia* is expected to grow from $400,000 in 1974 to $1 million in 1979 as modern methods are applied to basic research in high priority fields such as petrochemistry, biochemistry, biophysics, and medicine.

—Imports totaling $1.8 million provided 90% of the mass spectrometers sold in the *Netherlands* in 1974. U.S. firms led in sales and should improve their market share substantially. Imports from the U.S. are expected to advance from $600,000 in 1974 to $1.8 million in 1979

—The *Italian* market for MNR spectrometers is projected to rise from $850,000 in 1974 to $1.3 million in 1979, as their use becomes more widespread in laboratories of pharmaceutical manufacturers and producers of organic chemicals. U.S. firms supplied 70% of the Italian market in 1974 and this share should be maintained in 1979.

—*Israeli* purchases of pH meters are forecast to increase by 15% annually between 1974 and 1979. Less expensive models are locally produced and U.S. manufacturers should expect some competition from domestic and other foreign firms.

—Over 50% of the *German* market for densitometers consists of thin-layer and paper chromatography; the remainder is composed of scanners for electrophoresis. The scheduled modernization of medical laboratories research installations in Germany promises above average growth in sales of densitometers for clinical use. The market for densitometers is expected to expand dramatically through 1979 to reach $6 million. U.S. firms supplied over 50% of the market in 1974 with sales of $1.6 million.

Table 1.—The market for laboratory instruments by country, 1972, 1974 and 1979

(in millions of U.S. dollars)

	1972	1974	1979
Australia	22.4	39.0	58
Brazil	43.7	86.6	153
Czechoslovakia	28.9	41.6	66
Germany	144.2	217.7	282
Hong Kong	1.2	2.2	4
Iran	8.1	13.2	45
Israel	9.6	10.9	15
Italy	70.0	93.0	153
Japan	134.3	200.5	500
Mexico	10.4	17.0	27
Netherlands	35.8	66.2	114
Republic of China (Taiwan)	8.7	12.5	24
Spain	20.5	35.0	111
Sweden	46.0	74.0	136
United Kingdom	64.1	84.7	98
Venezuela	5.8	7.4	15
Total	653.7	1001.5	1805

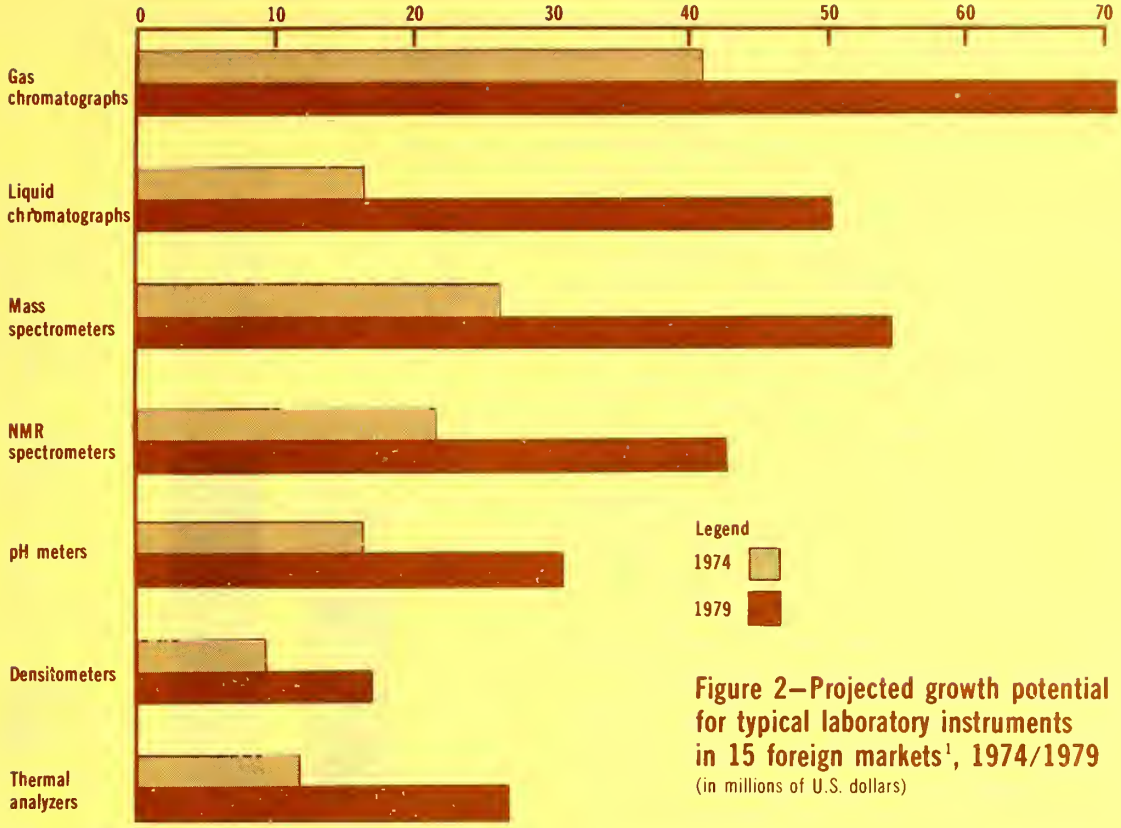
Source: Bureau of International Commerce, Office of International Marketing research studies.

—The 21% average annual growth rate projected for sales in *Germany* of thermal analyzers between 1974 and 1979 is based on increasing application in the main user industries—building materials, metallurgical research and chemicals. Thermogravimetric analyzers will account for half of the future sales in Germany and substantial investment will be made in differential thermoanalyzers.

Buyers for Laboratory Instruments

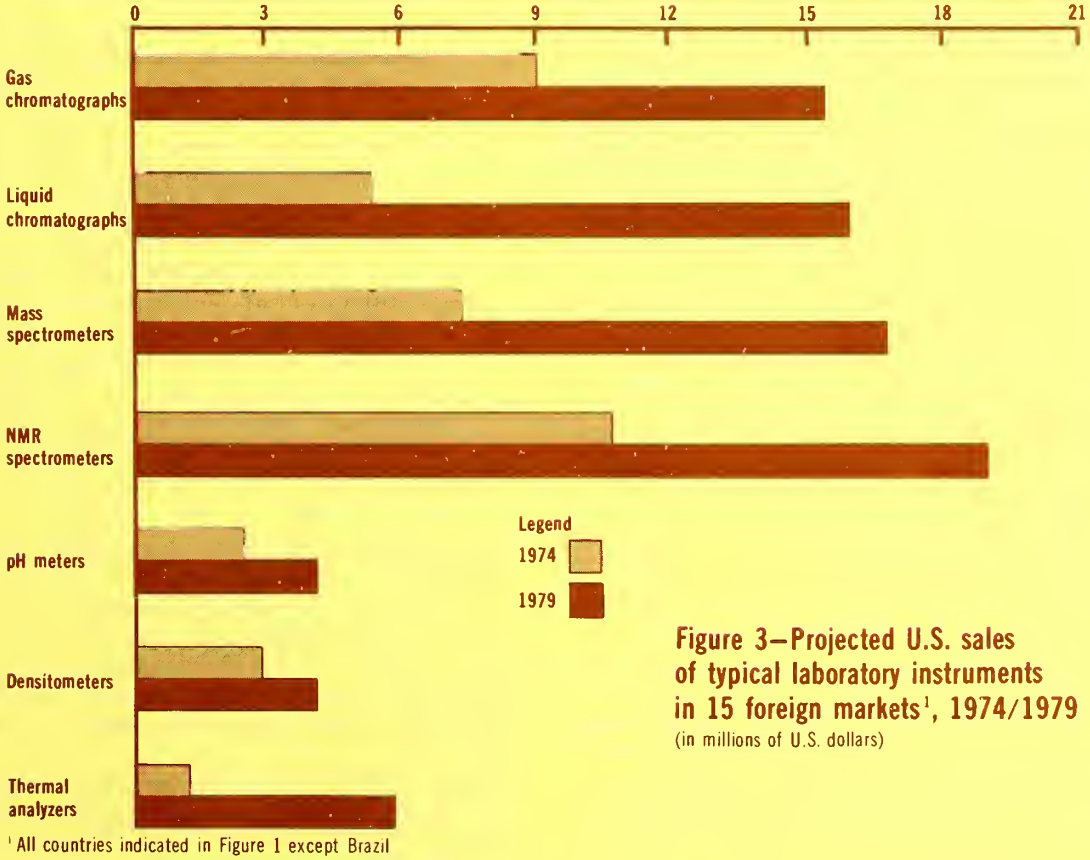
Government R&D Funding—The values and percentage shares of total laboratory instruments sales by major buyers are shown in Figure 4 for 1974 and 1979 (projected). Projected growth of laboratory instrument markets overseas is keyed to expected increases in research and development (R&D) funds. Trade sources forecast annual R&D expenditures in the 16 surveyed countries should near $50 billion in 1979 or about 35% more than the $35 billion spent on R&D in the *United States* in 1975.

Similar to the United States, the central governments are the major source of R&D funds in most foreign countries (see table 4). Among the 16 countries surveyed only four (Czechoslovakia, Netherlands, Sweden, and Japan) received less than half of their R&D funds from the government. On the other hand, in most of the less industrialized countries the government contributed 70% or more to R&D expenditures. In Mexico, the Government supplied 85% of R&D funds in 1974; Spain (85%), Venezuela (81%), Republic of China (80%), Brazil (72%), Hong Kong (71%) and Australia (70%). The central government provided the bulk of R&D funds even in highly developed economies such as the United Kingdom (58%), the United States (52%), and Germany (51%).



[1] All countries indicated in Figure 1 except Brazil

Figure 2—Projected growth potential for typical laboratory instruments in 15 foreign markets[1], 1974/1979
(in millions of U.S. dollars)



[1] All countries indicated in Figure 1 except Brazil

Figure 3—Projected U.S. sales of typical laboratory instruments in 15 foreign markets[1], 1974/1979
(in millions of U.S. dollars)

Whereas government is the principal supplier of R&D funds, industry is the primary user of such monies.

Industrial expenditures should account for more than half, nearly $28 billion, of the total R&D budget in 1979. In developed economies, such as Germany, United Kingdom, Japan, Netherlands, Sweden, Czechoslovakia, and Italy, industry takes the initiative in R&D and utilizes the majority of available funds. In most of the less industrialized nations, the central government or educational and nonprofit institutions account for the majority of R&D expenditures. The national governments in Spain, Australia, Republic of China, Mexico, and Brazil retain the greatest share of the R&D budget. Educational and nonprofit institutions are the center of R&D activities in Hong Kong, Israel, and Venezuela. In each of these three countries substantial grants come from the central government and go to the universities to support R&D programs.

Industrial laboratories.—Sales to the industrial sector are expected to climb from $531 million in 1974 to $953 million in 1979, representing an average annual growth rate of 12.4%. Laboratory expenditures are expected to more than double during the same period, rising from over $9 billion to $19 billion. Industry is increasing its laboratory expenditures in response to increased competition and growing consumer demands for new and better products. Many managers feel that R&D budgets should be increased during economic recessions so that when the economy picks up, the industry will be in a position to offer new produets. R&D funds utilized by industry are expected to grow by an average of 9.8% annually between 1974 and 1979 in the 11 surveyed countries for which data is available.

The chemical industry is the largest industrial purchaser of laboratory instruments. Sales of laboratory instruments are expected to grow by 12% annually from nearly $126 million in 1974 to about $222 million in 1979. Significant in the planned purchases to be made are:

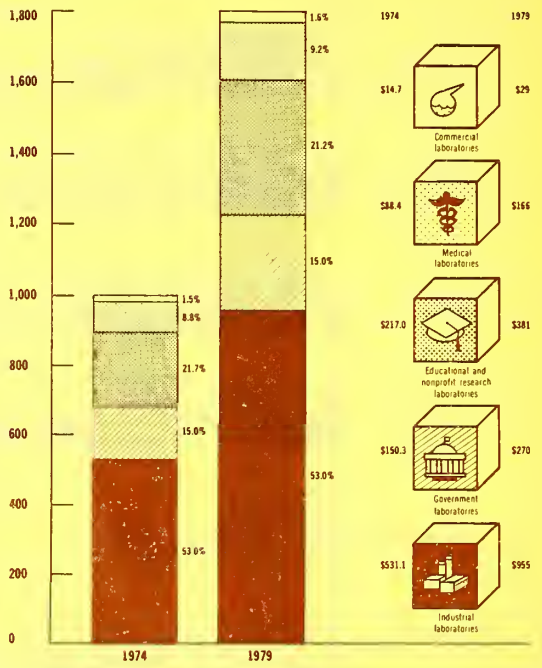
Activation analysis equipment
Air sampling analysis equipment
Gas chromatographs
Atomic absorption spectrophotometers
Fluorimeters
Energy dispersive X-ray analyzers
Oxygen analyzers
Infra-red spectrometers
Automatic analyzers
NMR spectrometers
Polarographs

Each Country Market Survey on laboratory instruments gives examples of the types of research activity being undertaken. Two examples are:

—In the *Netherlands*, elpshais will focus on the electrochemistry of molten salts and complex formation in concentrated solutions; thermodynamic stability of stationary states in continuous reactive systems; development of measuring methods for ion-Newtonian liquids; nitrogen components in natural oils; biodegradation of hydrocarbons and mineral oils; and mechanism and cybernetics of the disproportion of olefins.

—In *Germany* the chemical industry is frequently funded by the Government to conduct research. Recent emphasis has been placed on the development of environment-protection technologies. Other major projects in progress in 1975 include: coal liquefaction; electro-chemical synthesis of organie sulfones; distribution of pesticides in the soil-plant system; synthesis of carbonyl compounds; high temperature pyrolysis processes and recycling of used, high-temperature reactor elements.

Figure 4—The Market for Laboratory Instruments by Major Buyers, 1974 and 1979
(in millions of U.S. dollars)



The primary metals industry is also a major purchaser of laboratory instruments. Sales to this industrial sector are expected to exceed $87 million in 1979 in the surveyed countries. Trade experts foresee growth in the market sector averaging 11.8% annually between 1974 and 1979. At the same time, laboratory expenditures should grow from nearly $600 million to over $1.2 billion.

Instruments needed by the industry include:

Energy dispersive X-ray and multichannel X-ray spectrometersl

Table 2.—Typical laboratory instruments: Total market forecast, 1979

(in millions of U.S. dollars)

Product lines:	Germany	Italy	Netherlands	Spain	Sweden	United Kingdom	Australia	Japan	Hong Kong	Taiwan	Iran	Israel	Mexico	Venezuela	Czechoslovakia	TOTAL**
Gas chromatographs	9.0	3.4	5.0	1.0	2.2	6.7	2.4	34.5	.3	1.0	2.1	.8	.8	.7	1.6	71.4
Liquid chromatographs	3.0	1.1	2.0	1.3	1.2	3.5	2.4	32.1	*	.4	.5	1.6	—	.2	1.0	50.3
Mass spectrometers	11.0	.8	4.5	.8	1.5	4.0	1.9	25.9	*	.2	2.2	.5	.1	.5	.9	54.7
NMR spectrometers	8.0	1.4	3.0	.2	1.8	2.6	1.1	21.6	—	.1	1.4	.5	—	.1	1.2	42.8
pH meters	2.0	.6	1.6	.8	1.2	2.3	.9	17.2	*	.2	.2	.6	.8	2.0	.5	30.8
Densitometers	6.0	.4	1.8	.4	.6	.3	.5	5.2	*	*	.2	.1	.1	.2	1.0	17.0
Thermal analyzers	3.5	.8	1.0	.4	4.0	.3	1.1	14.7	*	.1	.2	*	—	.2	.4	26.7

*Less than $100,000.
**Sums of the country data by product line may not equal indicated totals because of rounding.

Table 3.—Typical laboratory instruments: Forecast of imports from U.S., 1979

(in millions of U.S. dollars)

	Germany	Italy	Netherlands	Spain	Sweden	United Kingdom	Australia	Japan	Hong Kong	Taiwan	Iran	Israel	Mexico	Venezuela	Czechoslovakia	TOTAL**
Gas chromatographs	2.7	.6	.8	.5	.5	1.7	2.0	1.7	.2	.7	1.7	.8	.7	.6	.2	15.1
Liquid chromatographs	1.2	.8	.9	.4	.3	1.4	1.9	6.4	*	.3	.4	1.6	—	.2	.1	15.9
Mass spectrometers	4.4	.2	1.8	.2	.9	1.6	.6	5.2	*	.1	.7	.1	.1	.5	.2	16.7
NMR spectrometers	4.0	1.0	1.5	*	.7	1.6	.6	8.6	—	*	1.1	.5	—	.1	.2	19.9
pH meters	.1	*	*	.2	.3	.5	.2	.9	*	*	.1	.3	.7	.7	*	4.1
Densitometers	2.4	.2	.3	*	.2	.1	.3	.1	*	*	.1	*	.1	.2	*	4.0
Thermal analyzers	1.1	*	.3	*	1.3	.1	.8	1.5	*	*	.1	*	—	.2	*	5.8

*Less than $100,000.
**Sums of the country data by product line may not equal indicated totals because of rounding.

Computer-controlled X-ray diffractometers

Ion-sensitive electrodes

Dilatometers

Activation analysis equipment

Differential thermal analyzers

Thermal gravimetric analyzers

Electron microscopes

Penetrometers

Gas analyzers

Magnetometers

The primary metals industry in several surveyed countries is carrying on extensive R&D programs.

—The *Japanese* primary metals industry, with the aid of a government subsidy, is developing a nuclear reactor to be used in the manufacture of steel. The process involves utilization of the heat in the helium coolant used in a multi-purpose high-temperature gas cooled reactor.

—The Government of *Sweden* is coordinating and providing partial funding for a 10 company joint research project involving potential industrial uses of hydrometallurgic phenomena. This program was prompted by the current interest in the conservation of materials through recycling.

Other industrial sectors which are important end-users of laboratory instruments include oil and gas extraction; food products; petroleum, rubber and plastic products; stone, clay, and glass; fabricated metal products; and transportation equipment. Major projects in these industries include the following:

—Fiat of *Italy* has several major chemical and ecological R&D projects underway. The firm is investigating lubrication and combustion, electrochemistry, nonpolluting paint and other protective coatings, and industrial pollution control techniques, all related to automotive application.

—An-upsurge in public concern about the quality of the foods offered for sale in *Australia* has accompanied the rapid rise in consumption of processed foods. The food products industry has been accused of failure to perform sufficient analytical tests to determine the nutritional value of its products and of laxity in the entire area of quality control. The government has responded by formulating more stringent regulations covering plant sanitation, standards of wholesomeness, and product labeling. Most companies will have to upgrade their laboratory facilities to satisfy the new requirements.

Table 4.—Research and development funds by source and use 1974 and 1979

	1974				1979			
	Government	Industry	Educational & nonprofit Institutions	Total	Government	Industry	Educational & nonprofit Institutions	Total
Australia				374				1,640
Source of funding	260	105	9		1,181	410	49	
Use of equipment	203	95	76		890	410	340	
Brazil				499				1,509
Source	359	70	70		1,077	216	216	
Use	179	150	170		538	555	416	
Czechoslovakia				1,232				2,000
Source	512	720	—		815	1,185	—	
Use	129	1,067	36		230	1,710	60	
Germany				8,760				12,940
Source	4,460	4,300	—		6,920	6,020	—	
Use	1,050	4,900	2,810		1,680	7,250	4,010	
Hong Kong				7				11
Source	5	1	1		7	2	2	
Use	2	1	4		3	1	7	
Israel				160				207
Source	86	24	50		97	39	71	
Use	25	54	81		29	60	118	
Italy				1,328				2,230
Source	672	634	22		1,150	1,000	80	
Use	283	703	342		330	1,200	700	
Japan[2]				8,200				19,100
Source	2,300	4,800	1,100		5,400	11,200	2,500	
Use	700	4,900	2,600		1,600	11,500	6,000	
Mexico				152				245
Source	129	23	—		208	37	—	
Use	56	43	53		90	69	86	
Netherlands				1,360				1,950
Source	630	730	—		850	1,100	—	
Use	290	790	280		400	1,170	380	
Republic of China (Taiwan)				35				56
Source	28	2	5		45	3	8	
Use	18	2	15		28	2	26	
Spain				683				1,983
Source	582	101	—		1,690	293	—	
Use	463	178	42		1,342	518	123	
Sweden[2]				740				1,540
Source	308	425	7		585	940	15	
Use	160	510	70		300	1,110	130	
United Kingdom[2]				3,355				3,960
Source	1,943	1,395	17		3,160	1,775	25	
Use	1,066	2,068	221		1,470	2,200	290	
Venezuela				158				310
Source	128	20	10		245	45	20	
Use	40	34	84		80	80	150	

[1]1969 data instead of 1974.

[2]1973 data instead of 1974.

Source: Bureau of International Commerce, Office of International Marketing research report.

—The Iran's oil and gas extraction industry has centered its research activities on; exploration to increase the known reserves; product and raw material quality control; studying the effectiveness of oil mulches; and the measurement of air and water pollution resulting from oil and gas extraction.

Scientific and Educational Laboratories.— These facilities constitute significant end-user markets for laboratory instruments. Total scientific and educational expenditures were estimated at close to $3.3 billion in 1974 and should exceed $6.1 billion in 1979. Sales to these institutions in the countries surveyed, are expected to exceed $380 million in 1979, maintaining an average annual growth rate of 12% over the 1974 level of $217 million.

Several nations are placing increased emphasis on education in the natural and life sciences. Many developing countries are stressing scientific study to develop an indigenous staff of scientists capable of establishing a research base in the country. These nations want to initiate R&D programs that would permit conversion of natural resources into finished products for sale on the world market.

A number of developed nations are also beginning to stress the sciences in their educational systems. During the 1960s and early 1970s, public attention was focused on overcoming social problems. Educational institutions responded by restructuring their curricula to emphasize social studies. Instruction in the natural and life sciences suffered as a result. Public attention, partly because of the energy shortage,is again centered on technological improvements and research in the natural and life sciences. School systems are gearing to reflect this change by allocating additional funds to support scientific programs. Educational instrument sales will be generated by those institutions that intend to upgrade existing laboratories as well as equip new facilities.

Many governments are implementing plans to improve educational facilities.

—The Government of *Hong Kong* estimates that recurrent and capital grants to the Hong Kong University, The Chinese University of Hong Kong, and the Hong Kong Polytechnic Institute grew from more than $20 million in 1973 to $32 million in 1975. Future expansion plans include Phase II of the Chinese University Science Center, expansion and improvements to the Morrison Hill Technical Institute, and new technical institutes at Cheung Sha Wan, Kwun Tong and San Po Kong.

—*Sweden* adopted a policy of university decentralization in 1973. Branches of the universities and technical colleges at Stockholm, Gothenburg, Uppsala, and Lund are being established throughout Sweden, creating a need for new scientific laboratories and related equipments at each site. The Government recognizes the need to replace obsolete equipment in existing laboratories and perhaps enlarge the facilities devoted to laboratory work, and accomodate more students.

Table 5.—Laboratory expenditures and purchases of instruments by end user classification 1974 and 1979

(in millions of U.S. dollars)

	Laboratory Expenditures		Purchases of laboratory instruments	
	1974	1979	1974	1979
Government	2149	4024	150.3	270
Educational and nonprofit institutions	3298	6149	217.0	381
Independent commercial laboratories	162	348	14.7	29
Medical organizations	1625	3206	88.4	166
Industry	9052	18807	531.1	955
Oil and gas extraction	83	183	10.2	19
Food products	308	609	22.0	3
Chemicals	2045	4084	127.5	222
Petroleum	168	341	15.5	31
Rubber and plastic products	175	325	15.8	28
Stone, clay and glass	182	383	9.7	17
Primary metals	598	1211	49.6	87
Fabricated metal products	410	752	33.7	61
Transportation equipment	1440	2777	55.2	113
Other	3643	8142	191.9	338
Total	16286	32534	1001.5	1801

Source: Bureau of International Commerce, Office of International Marketing research studies.

Most of the developed countries have large nonprofit scientific research organizations responsible for a substantial portion of the R&D projects performed in the country. In many of the developing countries, the universities are the primary research centers.

—The most important nonprofit scientific research organization in *Germany* is the Max-Planck-Gesellshaft. It has a $220-million budget in 1973. This organization comprises 48 institutes-24 biological-medical, 15 physical-technological, and 9 in the humanities. Second in significance is the Fraunhofer-Gesellschaft with 14 institutes and a 1973 budget of $12 million.

—The universities perform most of the research activities in *Venezuela*. The largest individual institution is the Instituto. Venezolano de Investigaciones Cientificas (IVIC), a training center for graduate work in science. IVIC operates departments in biophysics and biochemistry, microbiology and cellular research, physics and chemistry, petroleum and petrochemicals, engineering and ecology, neurobiology, experimental medicine, anthropology and nuclear technology. Three of the largest laboratories, outside the IVIC, are located in the Universidad de los Andes in Merida,

the Universidad Simon Bolivar, and the Universidad Central de Venezuela. The latter has a sizable hospital laboratory engaged in medical analyses.

Sales to government laboratories in the countries surveyed are expected to advance from over $150 million in 1974 to $270 million in 1979 at an average annual increase of 12.5%. All laboratory expenditures are forecast to grow at a slightly faster rate, 13.7% annually, rising from over $2.1 billion in 1974 to $4 billion in 1979.

Government laboratories are engaged in a wide variety of research activities. Defense research is usually performed by the national government or under its auspices. Both national and local government agencies also are involved heavily in energy research, nuclear science, product and process safety testing, pollution control, oceanography, and agricultural research.

In the developing countries the scope of research activities carried on by government laboratories is broader than that undertaken in developed economies. Major research programs in developed countries tend to be in response to public pressure. Consumer demand for higher product standards and a cleaner environment will mean expansion of many government agencies. In developing countries, the government takes a more active role in the development of industries vital to the economic prosperity of the nation. Often research on basic industries such as petroleum, chemicals and agriculture is under the direct control of the government.

Descriptions of some of the major research activities presently undertaken by the various government agencies are outlined below.

—Government-owned companies under contract to the Army and the Navy perform the bulk of the military weapons R&D in *Spain*. The Empresa Nacional Snata Barbara de Industries Militares S.A. is developing a version of the multibarreled Gatling gun for anti-aircraft defense use. The radar-controlled computerized aiming system for this gun was developed by the Army's Ordinance Laboratory.

—The numerous government testing and evaluation laboratories in *Japan* investigate areas such as drugs and chemicals; agricultural chemicals; foodstuffs; radio-active substances; water, air, and soil pollution; and safety testing of materials.

—*Brazil's* government institutes are directly responsible for research in nuclear technology, aerospace, oceanography, petroleum and petrochemicals, electrical energy, and minerals resources. Programs are being expanded in each of these areas and several large new facilities are planned.

Clinical and Medical Laboratories.—Growing emphasis on diagnostic and preventive medicine has resulted in a need for larger and better equipped clinical and medical laboratories. Instruments will be purchased in conjunction with the expansion of laboratory facilities. Sales of instruments to the end-user sector were estimated at over $88 million in 1974 in the surveyed countries and trade sources predict that the market will reach $166 million by 1979. Total laboratory expenditures should exceed $3.2 billion in 1979, double the 1974 level of $1.6 billion.

Foreign clinical and medical laboratories will require specific types of laboratory instruments. Demand is expected to be particularly high for: amino acid analyzers, automatic analyzers, gas and liquid chromatographs, pH meters, balances, centrifuges, colorimeters, electron and proton microscopes, and spectrometers.

Market factors of significance to U.S. manufacturers of laboratory instruments include:

—In *Czechoslovakia*, the number of medical examinations performed is increasing steadily and laboratory technicians are scarce. Consequently, diagnostic laboratories are planning to replace manually-operated instruments with automated or semiautomated types.

—Future growth laboratory instruments sales is closely tied to hospital construction in the *United Kingdom*. About five new hospitals should be built over the next 5 years. Instruments to furnish the laboratories in these facilities should cost about $750,000. The National Institute for Medical Research has allocated $2.5 million for renovation of its facilities.

Independent Commercial Laboratories.—While the establishment of independent commercial laboratories is just beginning in many of the surveyed countries, their importance as an end-user of laboratory instruments is readily recognized. Instrument sales to this sector reached almost $15 million in 1974 and are predicted to exceed $29 million by 1979. During the same time period, laboratory expenditures should more than double, increasing from $162 million to $348 million.

As the salaries of skilled technicians and the cost of maintaining top-quality laboratories rise, more managers are closing under-utilized facilities in favor of sending material to independent commercial laboratories for analysis. This trend began in the developed countries. By 1974, Japan, Germany, Italy, Brazil, Sweden, the United Kingdom, and Australia had well established networks of commercial laboratories performing wide variety of analysis. Commercial facilities in these countries reported expenditures totaling $1 million or more for laboratory instruments in 1974. By 1979, almost all of the surveyed countries are expected to have commercial laboratories in operation.

A few of the significant developments in this sector are mentioned below.

—Independent food chemistry laboratories in *Germany* typically test food samples or study

harmful substances in foods for companies that may be engaged in disputes with official health agencies. They also supervise and control production for small food manufacturers who cannot afford their own laboratories.

—Industry in the *United Kingdom* is expected to turn to independent laboratories for help in handling their increased workload, particularly in the field of pharmacology, toxicology, and applied biology.

Competitive Assessment

Many American manufacturers of laboratory instruments are expanding their sales horizons to include a number of foreign markets. They are finding that the stiffest competition for sophisticated instruments is offered by European firms. U.S. and German manufacturers sell a wide range of laboratory instruments to all parts of the world. Switzerland is particularly known for its precision balances. Japan, long noted for its quality optical instruments, is now price competitive in other types of laboratory instruments.

Leading world exporters of laboratory instruments have been effectively marketing their products for some time. They rely heavily on foreign sales to maintain economies of scale in production and to maximize their return on development costs. To insure adequate market penetration. tration, they maintain aggressive representation through a number of capable sales representatives and maintain reliable after-sales service and spare parts support. Most devote considerable attention to developing new contacts and promoting new products and developing new applications for their instruments.

In several of the developing countries surveyed, local manufacturers offer strong competition in the simpler laboratory instruments. Domestic firms have a number of advantages over foreign suppliers such as lower prices, tariff protection, import licensing, short delivery times, prompt parts supply and repairs. However, the technology gap between locally produced and imported equipment generally is wide, leaving each with its distinct market. Specialized and advanced types of instruments are predominantly imported from various European and American makers.

Foreign customers report that American companies could increase their sales through a more concentrated marketing effort. Some U.S. companies, recognizing this, have sharply increased their activities in the international market.

The following basic steps are suggested for firms seeking to initiate penetration in foreign markets:

—Establish effective sales representation abroad.

—Participate in overseas trade exhibitions.

—Provide for sales and technical literature written in appropriate languages.

—Advertise in trade publications and contribute articles to trade journals.

—Maintain delivery commitments and effective aftersale service.

The Department of Commerce can assist U.S. manufacturers of laboratory instruments in capturing a greater share of the overseas market. Export information services supplied by the Department are listed and explained later in this survey. Companies interested in obtaining more information on the listed programs should contact the nearest Department of Commerce District Office.

The Product Category-Laboratory Instruments

The product category, laboratory instruments, comprises all instruments used in a research or testing laboratory to test, evaluate, analyze or measure the chemical composition of materials, the physical properties of materials or the performance of materials or processes. Under the Brussels Tariff Nomenclature (BTN), the Standard International Trade Classification (SITC) and the Standard Industrial Classification (SIC) systems of commodity classifications, there are no categories exclusively limited to laboratory instruments. Statistics used in the survey are trade source estimates based on the following classifications.

	BTN	SITC	SIC
Hydrometers, thermometers, pyrometers, barometers, hydrometers and similar instruments, nonelectric and nonelectronic.	90.23	861.96	38293
Instruments for measuring or controling the flow, depth, pressure or other variables of liquids or gases	90.24	861.97	38321
Instruments and apparatus for physical or chemical analysis, nonelectrical and nonelectronic	90.25	861.98	38321
Electrical and electronic measuring analyzing or automatically controlling instruments and apparatus	90.28	729.52	38292
			38321
			38253
Centrifuges and filtering and purifying machinery for liquid and gases, fluids and gases.	84.18B	719.23	38112
Microscopes and diffraction apparatus, electron and proton	90.11	861.33	38321
Compound optical microscopes, except electron and proton	90.12	861.34	38321
Galances, laboratory, except electrically or electronically operated	90.22	861.95	38112
Mechanical appliances for testing physical properties industrial materials	90.22	861.95	38292

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